Deprived or not deprived? Comparing the measured extent of material deprivation using the UK government's and the Poverty and Social Exclusion surveys' method of calculating material deprivation

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Abstract

Poverty can either be measured directly, through standards of living such as material deprivation, or indirectly through resources available, usually income. Research shows that the optimum measure of poverty combines these methods, a fact that the UK government took cognisance of in its tripartite measure of child poverty. For use in a birth cohort study, two methods of calculating material deprivation were tested: the method used by the UK government taken from the Family Resources Survey (FRS), and the methods used in the Poverty and Social Exclusion (PSE) study at Bristol University. Results show that the former measure, compared to the latter measure, underestimates the depth and extent of material deprivation among families with young children in Scotland.

Keywords: material deprivation, child poverty, UK, Scotland, quantitative methodology

Introduction

The 2010 UK Child Poverty Act, which obtained Royal Assent on 25 March 2010, places a legal duty on the current and future UK governments, on the devolved administrations and on local governments and their partners to tackle child poverty. It sets out targets that bind current and future governments to reduce four dimensions of child poverty by 2020: relative low income (<10%); absolute low income (<5%); material deprivation and low income combined (<5%); and persistent poverty (target to be set by 2015) for children living in poverty.

There is currently much focus on the child poverty targets, in particular on the chances under the current Conservative-led coalition government of (almost) eradicating child poverty by 2020. Many have noted the failure to meet the interim target of halving child poverty by 2010. The measure of child poverty set out in the

child poverty act comprises absolute and relative measures of income and material deprivation.

However, depending on how material deprivation is calculated greatly affects its extent and depth in the population. This paper is part of a wider study on the impact of family assets on children's cognitive, social, emotional and behavioural outcomes for families living in poverty, for which an index of multiple deprivation is to be calculated. The dataset used is the Growing up in Scotland (GUS) study, a birth and child cohort study of over 8000 children in Scotland (this study uses the birth cohort only, n = 5217). The 21 indicators of material deprivation from which an index is calculated are the same as those used in the Poverty and Social Exclusion (PSE) and the Family Resources Survey (FRS). The paper compares two methods of calculating multiple deprivation, the FRS method used by UK government and the one used by researchers in the PSE study at Bristol University.

Theoretical framework

The concepts in this paper originate with Townsend's theory of relative deprivation, which distinguishes between 'poverty' and 'material deprivation': the former pertaining to income and resources available (1987: 140) and the latter referring to 'conditions or activities experienced' (1987: 127). Using Townsend's concept, people can be said to be in poverty if they lack the resources to live a life free from deprivation (Townsend, 1979).

The concept of relative deprivation is centred on the tenet that human beings have social as well as physical needs (Lister, 2004). It is this focus on the conditions of life rather than the distribution of resources that distinguishes Townsend's concept of relative deprivation from the narrower concept of poverty (Alcock, 2006: 116, Lister, 2004).

The way in which Townsend operationalised his theory of relative deprivation was criticised, most notably by Piachaud (1981), because the items of deprivation to be used in the study were defined by Townsend and his research team, drawing accusations that the concept of deprivation was being imposed by 'elite observers'.

Taking this criticism into account, Townsend's methodology was advanced by the researchers on the 1983 *Living in Britain* survey, who conceived the 'consensual' or 'perceived deprivation' approach to measuring poverty. To construct a deprivation index, 'needs' were defined consensually by asking survey respondents about *their* views on what constitutes 'necessities' (Mack and Lansley, 1985: 45). This method is still used in the Poverty and Social Exclusion surveys and continues to be reviewed and updated (Gordon and Pantazis, 1997, Pantazis et al., 2006).

Measuring poverty using material deprivation

Material deprivation has become an influential measure of poverty but it is not without flaws. Using the omnibus survey of the Office for National Statistics (ONS) and the Poverty and Social Exclusion (PSE) data, both from 1999, McKay argues that the evidence that there is consensus on which items are essential is relatively weak (McKay, 2004: 203). Furthermore, his analysis reveals that those who lack 2 or more socially perceived necessities own other items that were not deemed essential, leading him to argue that ownership of items was a result of personal preference: '*It is therefore their particular choice of consumption profile that makes them appear poor, not their resources'* (McKay, 2004). However, the fact that people owned items that were not earlier categorised as necessary owes more to his first argument that consensus may not be sufficiently strong, more than his argument that spending behaviour is making people appear poor.

In addition to the personal preferences of those who cannot afford items considered essential while affording those that are considered inessential, there is a further criticism of material deprivation based on choice. Living in material deprivation is not necessarily caused by poverty as people may *choose* not to have the goods or participate in the events that indicate material deprivation even though they can afford to should they wish. This element of choice means that the study of poverty cannot rely on material deprivation as its sole measure, thus it is only when it is imposed by insufficient command of resources that it can be conceived as a dimension of poverty (inter alia Pantazis et al., 2006). Poverty can thus be considered a '*state of general deprivation which is characterised by both a low standard of consumption and a low level of income'* (Ringen, 1988: 36).

Trying to identify the poor using either income or material deprivation separately results in different groups of people being identified as living in poverty; there is no great overlap between the two measures (Bradshaw and Finch, 2003). There are several reasons why this may be so; false consciousness, intra-familial transfer, low aspirations or expectations, measurement error and the lagged effect of income poverty on living standards (Bradshaw and Finch, 2003). A decline in living standards anticipated from a loss of income can be held in abeyance due to existing wealth (e.g. savings), access to financial support from family and friends, and access to credit, while a recent escape from poverty will take time to result in increased consumption and the acquisition of goods.

Studies that explore low income and material deprivation in combination show that it produces a more robust measure than income poverty alone, that it reduces the measurement error incurred when relying solely on income and that it more effectively identifies those living in poverty (Townsend, 1979, Callan et al., 1993, Gordon and Pantazis, 1997, Bradshaw and Finch, 2003, Whelan et al., 2004, Pantazis et al., 2006). Across the years research has continued apace to reduce the limitations associated with the measure of material deprivation and the indicators continue to be updated and reviewed, most recently for the 2011 PSE survey. Thus, in spite of the criticisms, the consensus remains that measuring income poverty and material deprivation together gives the most robust measure of living in poverty.

Research Design

In GUS, data on material deprivation is collected at wave 4 only (2008-2009) using the affordability of 21 individual indicators, consensually agreed to be necessary in today's society (Bradshaw et al., 2009). There are two methods to combine these items into an index of multiple deprivation: the UK government method of prevalence weighting with a threshold of 25 to indicate material deprivation as used in the Family Resources Survey (FRS); and the PSE surveys' method of a direct count with statistical analysis to determine the optimum threshold.

The research design follows each method of deriving an index of material deprivation in turn and examines the impact of each on the measured extent of material deprivation among families with young children in Scotland.

Variables

Material deprivation variables

For material deprivation, the individual indicators are:

1. keep your home adequately warm
2. two pairs of all weather shoes for each adult
3. enough money to keep your home in a decent state of repair
4. a holiday away from home for one week a year, not staying with relatives
5. replace any worn out furniture
6. a small amount of money to spend each week on yourself, not on your family
7. regular savings (of £10 a month) for rainy days or retirement
8. insurance of contents of dwelling
9. have friends or family for a drink or a meal at least once a month
10. a hobby or a leisure activity
11. replace or repair broken to let cool goods such as refrigerator or washing machine
12. a holiday away from home at least one week a year with his or her family
13. swimming at least once a month
14. a hobby or a leisure activity
15. friends round for tea on a snack once a fortnight
16. enough bedrooms for every child over 10 of different sex to have his or her own bedroom
17. leisure equipment (for example, sports equipment on a bicycle)
18. celebrations on special occasions such as birthdays, Christmas or other religious festivals
19. playgroup/ nursery/toddler group at least once a week for children of preschool age
20. going on a school trip at least once a term for school-aged children.

21. Access to safe outdoor space nearby.

(Scotcen, 2008: 35, Pantazis et al., 2006: 13)

Given the young age of the children at this sweep in GUS (4 years old, children start school aged 5 in Scotland), item number 20, going on a school trip was omitted.

Income poverty variable

For income poverty, the measure used is the same as the current measure of income poverty in the UK and the European Union, 60% of median equivalised income, using the modified OECD equivalence scale. The modified OECD equivalence scale gives the weight of 1.0 for the first adult in a household, 0.5 for an additional person aged 15 years or over, and 0.3 for any children aged 0- 14 years (Chanfreau and Burchardt, 2008). Equivalence scales are arbitrary, and one criticism noted by Chanfreau and Burchardt (2008) is that they take no account of the additional resources required by families living with a disability. Despite these valid reservations, however, equivalisation allows for '*a clear and easily accessible poverty line, which does involve a relative definition which can be compared over time and across different populations*' (Alcock, 2006: 84).

Table 1 – extent of income poverty in GUS sweep 4 (2008-2009)

Sweep 4 poverty	count	percentages
No poverty	2736	72.27
Poverty	1050	27.73
Total	3786	100

Counts and percentages based on weighted data
Sweep 4 cross sectional weight and survey weights used
Source: GUS sweep 4
Poverty based on 60% median equivalised income (OECD modified)

Using the modified OECD equivalisation scale and applying weights to take account of the survey and sampling design, the extent of income poverty in Scotland in sweep 4 (2008-2009) using GUS data is almost 3 in every 10 families (table 1). This compares to the official before housing costs (BHC) child poverty rate of 21% and the after housing costs (AHC) child poverty rate of 26% in Scotland at this time

(Government, 2010). The higher incidence of poverty in the GUS data compared to the official measure of child poverty can possibly be attributed to the fact that being a family with young children is in itself a risk factor for poverty (Smith and Middleton, 2007, Harris et al., 2009).

It should be noted that a weakness of the income data used is that the GUS survey is not dedicated to measuring income, wealth and poverty, like the FRS and PSE surveys are; instead the income data is collected using respondent recall, usually the mother's. This has been known to result in underestimates of family income (Barnes et al., 2010: 12).

Analysis

The UK government method of calculating material deprivation (FRS)

The UK government in their Family and Resources Survey (FRS) use a method to calculate the index of material deprivation known as prevalence weighting. Desai and Shah posit that using prevalence weighting, or weighting by 'modal frequency' of an item of deprivation according to the proportion of respondents in the population having that item, provides a more robust index of material deprivation than Townsend's method of equal weighting (1988). Their justification for prevalence weighting is that each item of deprivation has an unequal expenditure implication and a different priority for each household (1988: 511). Their method of prevalence weighting, they argued, would '*do justice to the inter-personal variation without losing the social dimension of deprivation'* (Desai and Shah, 1988: 511).

The FRS's method of prevalence weighting is to weight items according to the proportion of the population owning that item, whereby more common items are more highly weighted than less common items. A summation of the weighted items is divided by the sum of the weights to create a continuous index of material deprivation. The standard cut off point to identify those who are materially deprived is 25, a threshold that appears to be arbitrary and certainly no government research provides calculations to defend it, and which has not changed in the years since the index was first generated. To determine whether the threshold of 25 is a sensible level

in GUS, analysis of different thresholds was undertaken to determine the effect this would have on the extent of material deprivation in this study.

Table 2 the extent of material deprivation using the FRS method

Material deprivation using FRS method	Percent deprived	Percent change
Threshold of 25	12.40	
Threshold of 20	16.40	32.25
Threshold of 15	21.10	70.16

Counts and percentages based on weighted data
Sweep 4 cross sectional weight and survey weights used
Source: GUS sweep 4

Table 2 above shows that using the FRS threshold of 25, 12.40% are materially deprived in the GUS data. When the threshold is changed from 25 to 20, a third more people move into the materially deprived category; the weighted percent rises from 12.40% to 16.40%. When the cut-off point is moved to 15, almost three quarters more people become materially deprived; the weighted percent moves from 12.40% to 21.10%. This is a stable increase and raises questions about both the arbitrary nature of the threshold - there does not seem to be any clear reason for using 25 over 20 or even 15 – and over the applicability of the FRS threshold to the GUS data per se.

As well as the question of the arbitrary threshold, questions can be raised over the necessity and applicability of prevalence weighting itself. There has been much research in psychological studies on the nature of prevalence weighting and whether it adds anything beyond the straight count method. Kline (2005) best summarises the argument against prevalence weighting:

> *'While much effort goes into discussing and determining differential item weights, Ghiselli, Campbell, and Zedek (1981) are persuasive in arguing that differential item weighting has virtually no effect on the reliability and validity of the overall total scores. Specifically, they say that "empirical evidence indicates that reliability and validity are usually not increased when nominal differential weights are used" (p. 438). The reason for this is that differential weighting has its greatest impact when there (a) is a wide variation in the weighting values, (b) is little intercorrelation between the items, and (c) are*

only a few items. All three are usually the opposite of what is likely to occur in test development. That is, if the test is developed to assess a single construct, then if the developer has done the job properly, items will be intercorrelated. As a result, the weights assigned to one item over another are likely to be relatively small. In addition, tests are often 15 or more items in length, thus rendering the effects of differential weighting to be minimized. Finally, the correlation between weighted and unit-weighted test scores is almost 1.0. Thus, the take-home message is pretty simple—don't bother to differentially weight items. It is not worth the effort' (Kline, 2005: 105).

As the 21 items of material deprivation in GUS adhere to the three conditions noted in Kline, it can be argued that there is no value to be added in propensity weighting. This will be tested by a doing correlation of the FRS prevalence weighted method of constructing the index with the PSE method, explored in the next section.

In the most recent Households Below Average Income (HBAI) report, in the Family resources Survey (FRS), four new material deprivation indicators are added to the existing list of 21 indicators, making an old material deprivation index of 21 items (the same ones used in GUS for this paper) and a new material deprivation index of 21 items, with 17 common items ((HBAI), 2012). Comparison between the two shows that the new material deprivation index resulted in a lower proportion of people living in material deprivation using the 25 threshold than the old material deprivation index. The conclusion of the FRS team was to reduce the threshold to 22 for the new index so that it would show the same proportion living in multiple deprivation as measured by the old index ((HBAI), 2012). This reduction in the depth and extent of material deprivation due to the new index, and the shifting of the threshold to accommodate it, provides further evidence of the arbitrariness of the threshold of 25, or indeed the new threshold of 22. This raises questions as to the validity and reliability of the UK and Scottish governments' measure of material deprivation.

The PSE method of calculating material deprivation

The PSE method comprises a straightforward count of the 21 deprivation items respondents are unable to afford, followed by ANOVA and binary logistic regression

models to obtain robust statistical confirmation of the optimum cut-off point that will identify the poor on number of items deprived (Pantazis et al., 2006: 66). This analysis is replicated with GUS data to create a summary measure of material deprivation using the PSE method.

Table 3 ANOVA results with varying deprivation thresholds

Number of items	R squared	F Statistic for Deprivation Group
Deprivation score of 1 or more	0.2057	820
Deprivation score of 2 or more	0.2114	850
Deprivation score of 3 or more	0.1875	750
Deprivation score of 4 or more	0.1675	633
Deprivation score of 5 or more	0.1383	511
Deprivation score of 6 or more	0.1144	404
Deprivation score of 7 or more	0.0929	309

Source: GUS sweep 4

The ANOVA models with GUS data show that the deprivation score that maximises the between group differences and minimises the within group differences (sums of squares) was 2 or more items, as shown in table 3 above. This would indicate that there is a significant change between equivalised income and the deprivation score of two or more, suggesting that this is one level where material deprivation occurs.

Table 4 Summary of logistic regression results

Number of items	Model Chi-square	Cox & Snell R Square	Nagelkerke R Square
Deprivation score of 1 or more	720	0.187	0.250
Deprivation score of 2 or more	774	0.200	0.278
Deprivation score of 3 or more	724	0.188	0.283
Deprivation score of 4 or more	649	0.171	0.284
Deprivation score of 5 or more	558	0.148	0.281
Deprivation score of 6 or more	465	0.125	0.274
Deprivation score of 7 or more	379	0.104	0.231

Sweep 4 cross sectional weight and survey weights used
Source: GUS sweep 4

To confirm and compare the results from the ANOVA, the PSE method uses binary logistic regression models, with the dependent variable the deprivation group and the independent variable the equivalised household income. Table 4 above gives the chi square, Cox and Snell's pseudo R^2 and Nagelkerke's pseudo R^2 statistics from these logistic regressions. The chi square and Cox and Snell's pseudo R^2 verify the findings of the ANOVA models, indicating that the optimum model is the one with a

deprivation score of 2 or more. However, using Nagelkerke's pseudo R^2, the optimum deprivation cut-off point is 4+ items. Nagelkerke's pseudo R^2 is considered a more robust measure than Cox and Snell, as it can achieve a score between 0 and 1, whereas Cox and Snell's pseudo R^2 cannot reach a score of 1. This analysis indicates that there are two relevant thresholds for material deprivation in the income distribution and the PSE survey reported similar results (Pantazis et al., 2006). To inform the decision on which threshold to use for this thesis, descriptive statistics show the percentages of families living in material deprivation based on each threshold.

Table 5 The extent of material deprivation using the PSE method

Material deprivation using PSE method	All %	Adults %	Children %
2 or more indicators	37.00	33.00	7.80
3 or more indicators	27.00	22.70	2.70
4 or more indicators	20.12	15.97	0.99

Counts and percentages base on weighted data
Sweep 4 cross sectional weight and survey weights used
Source: GUS sweep 4

Table 5 shows that almost twice as many people are categorised as living in material deprivation on 2 or more indicators as compared to 4 or more indicators. The table also shows that children are far less deprived than their parents, which supports the evidence that parents (predominantly mothers in GUS) forfeit their own material wellbeing to guarantee that of their children.

When faced with a similar choice of thresholds in the 1999 PSE data, Bradshaw and Finch decided to use, not the method of 2+ indicators as used by the PSE team, but a threshold of 4+ indicators as this gave a percentage living in deprivation that corresponded to the contemporary proportion of the population living in income poverty (2003).

Applying their logic, in Scotland at the time the official before housing costs (BHC) child poverty rate was 21%, the after housing costs (AHC) child poverty rate was 26% and the combined low income and material deprivation rate BHC for children was 16% (2010). Using the 4+ indicators described in table 5, 20.12% of families are

living in material deprivation in GUS, which corresponds to the 21% BHC proportion of the population in Scotland at the time. The threshold of 4+ indicators thus gives a material deprivation score that is more conservative than the 2+ indicators, is statistically robust and is comparable to the contemporary proportion of children living in income poverty.

Comparing the FRS and the PSE method

Kline (2005) noted that weighting the items in an index would have a minimal effect on the overall construct of the index, which could be tested by doing a correlation on the weighted and unweighted index. The Pearson product moment correlation between the FRS and PSE method is 0.9923 and the Spearman's rho is 0.9772 (the closer they are to 1, the more highly correlated the two measures are). This proves that the two measures are virtually identical in what they are measuring; only the thresholds differ and so there is no advantage in performing prevalence weighting in order to construct the index of material deprivation. The principal point of comparison between the two measures, therefore, lies in the thresholds chosen.

The PSE method of calculating the threshold to determine when an individual or family is living in material deprivation gives a measure that is justifiable and statistically robust, whereas the threshold of 25 (now 22 for the updated index) used by the UK government is arbitrary and unjustifiable. There is no question, therefore, that the PSE method for calculating a defining threshold is superior.

Conclusions

This paper analysed the two main methods used to construct an index of material deprivation from the same 21 items of deprivation, the method advocated by the UK and Scottish government using the Family Resources Survey (FRS) and the one used for the Poverty and Social Exclusion (PSE) surveys at Bristol University.

Using the PSE threshold, 20.12% of families in Scotland are living in material deprivation in Scotland, compared to the FRS threshold, which resulted in 12.40% of families living in material deprivation. The FRS threshold has been used since the

1990s, is arbitrary and has no statistical analysis to make it valid or reliable. The PSE threshold(s) by comparison, are statistically robust, valid, reliable and result in a proportion of families in Scotland materially deprived that is virtually identical to the proportion living in income poverty using contemporary government data.

The most recent analysis of FRS data, using 4 updated items of material deprivation, have resulted in an index that gives a lower proportion of families materially deprived than the old index ((HBAI), 2012). While the FRS team have adjusted the threshold to 22 to make the two proportions comparable, they have missed an opportunity to carry out robust analysis on the threshold per se.

While the GUS dataset is not the one used to calculate UK or Scottish government poverty rates, being as it is a survey of families with young children, the analysis of the two methods gives very different pictures of the extent of families living in material deprivation in Scotland. The UK and Scottish governments' method results in 60% *fewer* families being identified as living in material deprivation. If we extrapolate this method to the data on the wider population used by the governments to measure material deprivation, then we can assert that the arbitrary nature of their threshold is *underestimating* the extent of material deprivation, not only in Scotland but across the UK.

This has serious implications for the statutory requirement of the Child Poverty Act (2010) to eradicate child poverty by 2020. Given that one of the 4 targets of Act is to reduce income poverty and material deprivation combined to less than 5% incidence in the population, it is more important than ever that the correct calculations are made. Failing to adequately identify those in the population affected by low income and material deprivation combined, would mean that no matter what progress is made towards the target under the current measure, material deprivation would still exist and persist, despite the best efforts of the UK and Scottish governments (and other devolved administrations). Not only would this be demotivating and demoralising for everyone involved, if the correct identifying structures are not recognised, and the weakness of the current threshold not addressed, then UK governments and administrations will be left scratching their heads at the inevitable failure of their

laudable efforts, and may erroneously conclude that it is impossible to eradicate child poverty and material deprivation.

Acknowledgements

I would like to thank the Economic and Social Research Council (ESRC) for the funding for my PhD at the University of Edinburgh. I would like to thank my supervisors, Professor Kay Tisdall and Dr. Paul Norris for their support. I would also like to give my special thanks to Professor David Gordon for providing me with the details on how to undertake the analysis using the PSE method pioneered at Bristol University.

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